



## Study on Major Causes of Organs Condemnation and Financial Loss in Cattle Slaughtered at Hayik Municipal Abattoir

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### ABSTRACT

A cross-sectional study was conducted from October, 2016 to April, 2017 to identify and determine the major diseases and pathological conditions of organ condemnation and to estimate the magnitude of the direct financial losses attributed to the condemned organs from cattle slaughtered in the Hayik municipal abattoir. From a total of 384 animals, 61(15.88%) of animals antemortem inspection showed some clinical sign that were assumed as minor and attention was paid at postmortem examination of these animals. During post mortem examination from 384 slaughtered animal liver 72 (18.75%) followed by lung 25 (6.5%), heart 17(4.4%), kidneys 18(4.68%) and tongue 18(4.68%) were rejected due to various causes. The main causes of organ condemnation were fasciolosis 24(33.33%) followed by calcification, abscess and hydrated cyst 12(16.67%), 12(16.67%) and 9(12.5%) respectively. An attempt also made to estimate the direct financial losses due to condemnation of edible organs during meat inspection. Consequently, annual direct financial loss from organ condemnation was estimated to be 3,736,231.25 Ethiopian Birr. The study identified the parasitic disease as major causes of organ condemnation. Therefore, creation of awareness on animal attendants and/or cattle owners and abattoir workers about the effect of parasites and safe disposal of condemned organs must be made and recommended as the findings showed that the rate of organ condemnation at the abattoir is very high which signifies the need for rapid disease control programs to be implemented.

**Keywords:** Abattoir, Cattle, Causes, Financial Loss, Hayik, Organ Condemnation

Abattoirs played an important role in surveillance of various diseases of human and animal health importance. Surveillance at the abattoir allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific diseases (Alton *et al.*, 2010). Monitoring and other conditions at slaughter has been recognized as one way of assessing the disease status of herd, however this source of information is not fully exploited worldwide (Millar *et al.*, 2010). Abattoir data is an excellent option for detecting diseases of both economic and public health importance (Ababa and Hooshyr, 2006; Abbuna *et al.*, 2010). Especially in ascertaining the extent to which human is exposed to certain zoonotic diseases in addition to estimating

the financial implications of carcass condemnations (Jobber *et al.*, 1996). In developing countries, abattoir plays a major role in providing and serving sources of information and reference center for disease prevalence. Meat inspection is conducted in the abattoir for the purpose of screening animal products with abnormal pathological lesions that are unattractive and unsafe for human consumption. Meat inspection assists to detect certain diseases of livestock and prevent the distribution of infected meat that could give rise to disease in animal and human being and to insure competitiveness of products in the local market (Hinton and Green, 1993; Vanlontestijn, 1993). Abattoir data can be a source of valuable information on the incidence



and epidemiology of animal diseases conditions, to know to what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs and carcasses (Cadmus and Adesokan, 2009; Raji *et al.*, 2010).

The main causes of organ condemnation during post mortem inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and hydrated cyst in lung, liver and kidney are mainly involved (Sirak, 1991; Teka, 1997; Mezegebu, 2003). Parasites in the tropics are responsible for far greater loss to meat industry than any other diseases (Jobbers *et al.*, 1996). Livestock has been considered as the main component of agricultural sector in most parts developing countries. They provide food in the form of meat and milk and non-food items such as draft power, manure and transport services as inputs into crop production, and fuel for cooking (EASE, 2003). Ethiopia is known by its high livestock population, being the first in Africa and tenth in the world. The recent livestock population estimates that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultry (CSA, 2008). The primary aim of the abattoir is to produce healthy, wholesome and clean products which are safe for human consumption (Cadmus and Adesokan, 2009). As meat is the main source of protein to population, it should be clean and free from diseases of particularly importance to the public health as hydatidosis and fasciolosis among others (Sirak, 1991). Post mortem inspection is screening or sorting process devoted to separate the normal from abnormal meat. A proper post mortem inspection is important to detect and eliminate abnormalities including contamination. Those insuring that hygiene of meat fit the basic requirements for human consumption (Gravy *et al.*, 1999). The decision whether meat fits to appropriate standard for human consumption or not requires utilizing many skills of observation and evaluation. This expertise should be taken into consideration in the results of antemortem inspection (MOARD, 2006). Therefore, the main objectives of the study were to identify the major causes of organs condemnation in the animals slaughtered at Hayik municipal abattoir and to estimate the financial losses associated with organ condemnations in Hayik municipal abattoir.

## MATERIALS AND METHODS

### Study area

The study was conducted from October 2016 to April 2017 at Hayik municipal abattoir. Hayik town was situated at the north-east part of country at a distance of about 422 km away from the capital city (Addis Ababa), located at 11 08' North latitude and 39 38' East longitude and has an elevation of 2600 meter above sea level. The area gets 936 to 1070 mm Hg rainfall annually. The mean monthly minimum and maximum temperatures were 12.37 °C and 26.27 °C respectively.

### Study animals

The study animals were local zebu and cross breed (*Bos indicus*) bring to the abattoir for slaughter from different districts around Hayik town (Tewuledere, Wuchale, Mersa, Dessie Zuria and Cutaber).

### Study design

Cross-sectional study was carried out to estimate the cause of organ condemnation and to calculate the direct financial loss due to condemnation in cattle slaughtered at Hayik municipal abattoir.

### Sampling strategy

#### Active abattoir survey

#### Antemortem inspection

Randomly selected animals were subjected to routine antemortem inspection during which various risk factors such as body condition, breed and age of animals were scored. The body condition score of animals was classified according to Nicholson and Butter (1986). Accordingly, animals were grouped into poor, medium and good body conditioned. Estimation of age was carried out by examination of teeth eruption and categorized into adult and old.

#### Postmortem inspection

The postmortem inspection was conducted based on the guidelines set on manual on meat inspection for

developing countries (FAO, 1994). Accordingly, the liver, lung, heart, spleen, kidney and tongue were examined through visualization, palpation and systematic incision for any pathological lesions.

### Data collection

Important study variables like species of animal, age, types of breed, body conditions score, antemortem finding, types of condemned tissues or organs, causes of condemnation and price of condemned organs were collected according to the study procedures.

### Sampling and sample size determination

Animals belonging to a group of old and adult were randomly sampled using simple random sampling technique and examined by antemortem and postmortem examination. Sample size was calculated by Thrusfield, (2005) with 50% expected prevalence, 95% confidence interval and 5% desired absolute precision using the formula given:

$$n = \frac{(1.96)^2 P_{\text{expected}} (1 - P_{\text{expected}})}{d^2}$$

Where:

$n$  = required sample size,  $P_{\text{exp}}$  = expected prevalence;  $d$  = desired absolute precision.

Therefore, the minimum sample size of the present study was 384.

### Assessment of direct financial loss

The total financial loss due to organ condemnation was computed or determined by taking into consideration the condemnation rate or percentage of each edible organs which was determined by this study, average number of animals slaughtered in the abattoir per year from retrospective data of the abattoir, average weight of each organs and carcasses in kg, average current local market price of major organs and number of each condemned organ was used to estimate the economic loss. Average current local market prices of each organ were collected by questionnaire from the butcheries and customers. Both partial and total condemnation of organs was taken in to consideration for determining the losses. The price

of partially condemned organ was on an average was considered as half of that of full organs. The annual direct financial loss incurred due to organ condemnation was estimated by using the formula indicated below (Ogunrinade, 1982).

$$EL = \Sigma srx \times Coy \times Roz$$

Where:

$EL$  = Annual economic loss estimated due to organs and carcass condemnation

$\Sigma srx$  = Annual bovine slaughter rate of the abattoir

$Roz$  = Average cost of each bovines liver/ lung/ heart/ kidney and carcass.

### Data management and analysis

Collected data was entered in to Microsoft excel and summarized by descriptive statistical methods like mean, percentage and proportion. Then data was analyzed by using the latest version of SPSS software. The results of this study were considered statistically significant when P value is less than 0.05.

## RESULTS AND DISCUSSION

### Ante mortem examination

Out of 384 cattle slaughtered at Hayik municipal Abattoir 61(15.88%) of them had various types of abnormalities during antemortem inspection and the detail of the abnormalities were shown on Table 1.

**Table 1:** Abnormalities encountered during antemortem examination

Ante mortem findings	No. of Animals with abnormalities	Prevalence
Ectoparasites	16	4.16
Lacrimation	5	1.30
Lameness	6	1.56
Nasal Discharge	7	0.91
Blindness	5	0.65
Fracture	4	0.52
Depression	4	0.52
Localized infection	4	0.52
Branding	3	0.78
Emaciation	3	0.39
<b>Total</b>	<b>61</b>	<b>15.88</b>

Among these ectoparasites, nasal discharge, lameness and lacrimation were frequently observed.

### Post mortem Examination

All animal that had been examined by antemortem inspection were subjected to postmortem inspection. A total of 384 bovine were slaughtered and thoroughly examined by standard postmortem procedure. From the total organs examined 72(18.75%) livers, 25 (6.51%) lungs, 17(4.42%) heart, 18(4.68) kidney, 18(4.68%) tongue were condemned. From these condemned livers, fasciolosis was responsible for 24 (33.33%) liver condemnation followed by cirrhosis 15(20.83%), abscess 12 (16.67%) and the rest rejection rate was due to calcification 12 (16.67%), hydatidosis 9(12.5%). From these condemned kidneys, edema was identified as cause for 6 (33.33%) followed by hydatidosis 4 (22.22%), hydronephritis 4 (22.22%) and Emphysema 4(22.22%). Out of these condemned lungs, abscess 9(36.0%, followed by pneumonia 6(24.0%), and emphysema 6(24.0%) was the cause of the condemnation (Table 2).

**Table 2:** Pathological lesions for condemnation of different organs in Hayik municipal abattoir

Organs condemned	Cause of Condemnation	No of frequency causes	Prevalence of pathological lesion	Prevalence of organ condemnation
Liver	Fasciolosi	24	33.33%	18.75%
	Hydatid cyst	9	12.50%	
	Abscess	12	16.67%	
	Calcification	12	16.67%	
	Cirrhosis	15	20.83%	
	<b>Total</b>	<b>72</b>	<b>100.00%</b>	
Lung	Hydatid cyst	4	16.00%	6.51%
	Abscess	9	36.00%	
	Emphysema	6	24.00%	
	Pneumonia	6	24.00%	
	<b>Total</b>	<b>25</b>	<b>100%</b>	
Heart	Hydatid cyst	6	35.29%	4.425
	Abscess	5	29.41%	
	Edema	6	35.29%	
	<b>Total</b>	<b>17</b>	<b>100.00%</b>	

Kidney	Hydatid cyst	4	22.22%	4.68
	Abscess	6	33.33%	
	Emphysema	4	22.22%	
	Hydronephritis	4	22.22%	
	<b>Total</b>	<b>18</b>	<b>100.00%</b>	
Tongue	Abscess	7	38.89%	4.68
	Edema	6	33.33%	
	<i>C. bovis</i>	5	27.78%	
	<b>Total</b>	<b>18</b>	<b>100.00%</b>	
<b>Total</b>		<b>150</b>		<b>39.06</b>

The information collected from butchers and customers of current visceral organs at Hayke town. The total slaughter animal was 384 head of bovine species. Based on the parameter, the total financial loss during my study was estimated 7538 ETB as shown Table 3.

**Table 3:** Summary of organ condemned and their financial loss

Organ condemnation	No. of Organ Condemnation	Total No. of Organ of Condemned	Partial No. of Organ Condemned	Price	Total
Liver	72	69	3	60	4230
Lung	25	20	5	55	1237.5
Heart	17	15	2	44	704
Kidney	18	18	—	42	756
Tongue	18	15	3	37	610.5
<b>Total</b>	<b>150</b>	<b>137</b>	<b>13</b>	<b>230</b>	<b>7538</b>

The total annual direct loss recorded due to rejection of visceral organ was 3,736,231.25 ETB as shown in Table 4.

**Table 4:** Total annual loss due to condemnation of organs

Organ	Average rejection rate	Av. annul slaughter rate	Av. price of organ	Annual loss
Liver	18.75%	1825	60	2053125
Lung	6.51%	1825	55	653441.25
Heart	4.42%	1825	44	354926
Kidney	4.68%	1825	42	358722
Tongue	4.68%	1825	37	316017
<b>Total</b>	<b>39.04</b>	<b>7300</b>	<b>230</b>	<b>3,736,231.25</b>

Analysis of potential risk factors with animals from which organ condemned revealed that there is statistically

significant difference ( $P < 0.05$ ) between age, body condition score respectively. From the total 352 local and 32 cross breed animal, the organ condemned was 105 and 45 respectively. However, there was no statistically significant difference between breed ( $P > 0.05$ ) (Table 5).

**Table 5:** Over all organ condemnation rate by breed, age and body condition score

Variables		No. animals Slaughtered	Organ condemned	Prevalence of organ condemned
Breed				
	Cross	32	45	11.71%
	Local	352	105	27.34%
	<b>Total</b>	<b>384</b>	<b>150</b>	<b>39.06%</b>
Age				
	Adult	262	125	32.55%
	Old	122	25	6.51%
	<b>Total</b>	<b>384</b>	<b>150</b>	<b>39.06%</b>
Body Condition score				
	Good	169	36	9.37%
	Medium	146	80	20.83%
	Poor	69	34	8.85%
	<b>Total</b>	<b>384</b>	<b>150</b>	<b>39.05%</b>

The present study revealed that fascioliasis, hydatid cyst, calcification, *Cysticercus bovis*, pneumonia, emphysema, hydronephrosis, cirrhosis were causes of condemnation in cattle slaughtered at Hayik municipal abattoir. From a total of 384 of cattle slaughtered, 150 (39.06%) organs of cattle were condemned because of different diseases and pathological findings. Out of the total examined organs 72 (18.75%) liver, 25 (6.51%) tongue 18 (4.68%) lungs, 18 (4.68%) kidneys and 17 (0.04%) hearts were condemned.

The rate of liver condemnation rate in this study was less than the report of Denbarga *et al.* (2011) in Gondar ELFORA abattoir which was 31.1% and Amene *et al.* (2012) in Jimma municipal abattoir which was 64.44%. These might be due to good health care, extensive cattle husbandry and grazing system. Accordingly, 33.33%, 20.83%, 16.67% and 16.67% of liver was condemned due to fascioliasis, cirrhosis abscessation and calcification respectively. This study indicated that fasciolosis was the major cause for liver condemnation. This finding agrees with the finding of Haimanot (2015). This may be due to highly presence of swampy area in the study area.

The rate of lung condemned due to hydatid cyst, pneumonia and abscessation was 16%, 24% and 36% respectively. In this study, abscess was the main cause of lung condemnation, which is disagree with the finding of reports by Denbarga *et al.* (2011) and Mewcha (2009) they report hemorrhage was the main cause of lung condemnation. Pneumonia was found to be another cause of lung condemnation. The rate of condemnation due to emphysema (24.0%) was higher than the report by Fasil (2009) with 1.2% rejection rate.

The present study also showed that the heart was condemned due to hydatid cyst, edema and abscess and its rate of rejection was 6 (35.29%), 6 (35.29%) and 5 (29.41%) respectively. This finding agrees with Fasil (2009) reported that hydatid cyst was the most common cause of heart condemnation at Gondar abattoir. This may be due to ingestion of feeds contaminated with echinococcosis parasite egg lay on the feed from the dog.

In the current study, kidney was condemned mostly due to edema and which account 33.33% hydronephritis 22.22% and were also other causes of condemnation. According to the report by Fasil (2009) the main cause of kidney rejection were hydronephrosis from cattle slaughtered in Gondar ELFORA abattoir with the rejection rate of 0.33%. So that the present finding was disagreeing with Fasil (2009) this may be due to the environmental variation.

The total financial loss calculated in this study, due to organ (Liver, lungs, heart, kidneys and tongue) condemnation was 3,736, 231.25. Ethiopian Birr/year which is higher than financial loss analysis done in Ambo and Sodo Municipal Abattoir which was estimated to be 160,032.23 and 4000 USD as reported by Zewdu *et al.* (2008) and Abunna *et al.* (2010) and the financial loss due to organ condemnation in Wolaita Soddo Municipal abattoir by Fufa and Debele (2013) was estimated to be 24,340 ETB (24323.49 USD). These may be due to the variation in the cost of the each organ in different study areas and numbers of organ condemned during the study period.

## CONCLUSION AND RECOMMENDATIONS

In the present study fasciolosis, edema, hydatid cyst, hydronephrosis, cirrhosis, and cysticercosis were found to be the major causes of organ condemnation. This study

revealed that the main causes of organ condemnation were parasitic diseases and pathological conditions in cattle slaughtered at Hayik municipal Abattoir resulting in considerable financial loss of about 3,736,231.25 ETB per annum. Hence, this study may be valuable for the country by providing data in monitoring disease conditions and management practices of animals that have public health hazard and aesthetic value and consequently of economic significance as most of the observed conditions leading to condemnation of organ.

Based on this concluding remark the following recommendations are forwarded:

- ⊙ Standard regulations and functional meat inspection procedure should be properly conducted in the abattoir to provide safe and wholesome meat to the consumer.
- ⊙ Immediate, safe and controlled elimination of all condemned abattoir materials to break the cycle of pathogens.
- ⊙ Awareness should be created in producers, local and medium traders, of the animal attendants, farmers, customers and abattoir workers regarding the public health significance of disease of animal origin and the related losses.
- ⊙ Regular deworming of animals and grazing management of animals during dry season to avoid access of the animals to the parasites egg are important.

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